

CLAIMS

- Sub. Q1
1. A solid phase microextraction apparatus, comprising:
a support structure; and
a sample collection substrate on the support structure, wherein
the substrate comprises a material selected from the group consisting of
5 organic aerogels, inorganic aerogels, organic xerogels, inorganic xerogels,
and combinations thereof.
2. The apparatus as recited in Claim 1, wherein the support structure is
formed of a material selected from the group consisting of glass fibers,
plastic fibers, stainless steel wire, and kovar wire.
3. The apparatus as recited in Claim 1, wherein the collection substrate
comprises at least one thin film on the support structure.
4. The apparatus as recited in Claim 3, wherein the collection substrate
comprises a plurality of layers on the support structure.
5. The apparatus as recited in Claim 1, wherein the collection substrate
comprises particles.
6. The apparatus as recited in Claim 5, wherein the collection substrate
comprises a mixture of particles having at least two chemical
compositions.
7. The apparatus as recited in Claim 1, wherein the collection substrate
comprises a thin film and particles.

8. The apparatus as recited in Claim 7, wherein the collection substrate comprises a thin film of xerogel on the support structure and aerogel particles on the thin film.
9. The apparatus as recited in Claim 1, wherein the collection substrate comprises a layer of microspheres on the support structure.
10. The apparatus as recited in Claim 1, wherein the collection substrate comprises an organic material and an inorganic material.
11. The apparatus as recited in Claim 1, wherein the collection substrate further comprises at least one metal dopant selected from the group consisting of transition metals, rare earth metals, alkaline earth metals, and alkali metals.
12. The apparatus as recited in Claim 1, wherein the support structure has two ends, one end containing the collection substrate and having a smaller outer diameter than the other end.
13. A method for forming a solid phase microextraction apparatus, comprising:
 - applying a layer of a gel precursor solution on at least the end of a support structure; and
 - drying the layer to form a sample collection substrate, wherein the substrate comprises a material selected from the group consisting of organic aerogels, inorganic aerogels, organic xerogels, inorganic xerogels, and combinations thereof.

14. The method as recited in Claim 13, further comprising applying particles on the layer before drying the layer, wherein the particles comprise a material selected from the group consisting of organic aerogels, organic xerogels, inorganic aerogels, inorganic xerogels, and combinations thereof.
15. The method as recited in Claim 13, wherein drying the layer is selected from the group consisting of evaporative drying and supercritical extraction.
16. The method as recited in Claim 13, further comprising applying a plurality of layers of the gel precursor solution.
17. The method as recited in Claim 13, wherein applying the layer is carried out by a method selected from the group consisting of dipping, rolling, and spraying.
18. The method as recited in Claim 13, wherein the layer comprises xerogel and further comprising applying particles of aerogel on the layer before drying the layer.
19. The method as recited in Claim 13, further comprising etching at least the end of the support structure before applying the layer.
20. The method as recited in Claim 13, further comprising heating the sample collection substrate on the support structure after drying to condition the substrate.

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